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well represents this form ; as does also a specimen secured by Dr. Baldwin in the same State. This last is the type of the variety of *Uvaria pygmaea* mentioned by Torrey and Gray in their Flora of North America.*

The Development of the Antheridium of *Targionia hypophylla*.†

BY EFFIE B. MCFADDEN.

(PLATE 268).

One of the most characteristic of our Californian liverworts is *Targionia hypophylla*, a species common in southwestern Europe, but which has not been described from the eastern United States.‡ The specimens studied were collected mostly in October and November on the slopes of sandy banks in the vicinity of Stanford University.

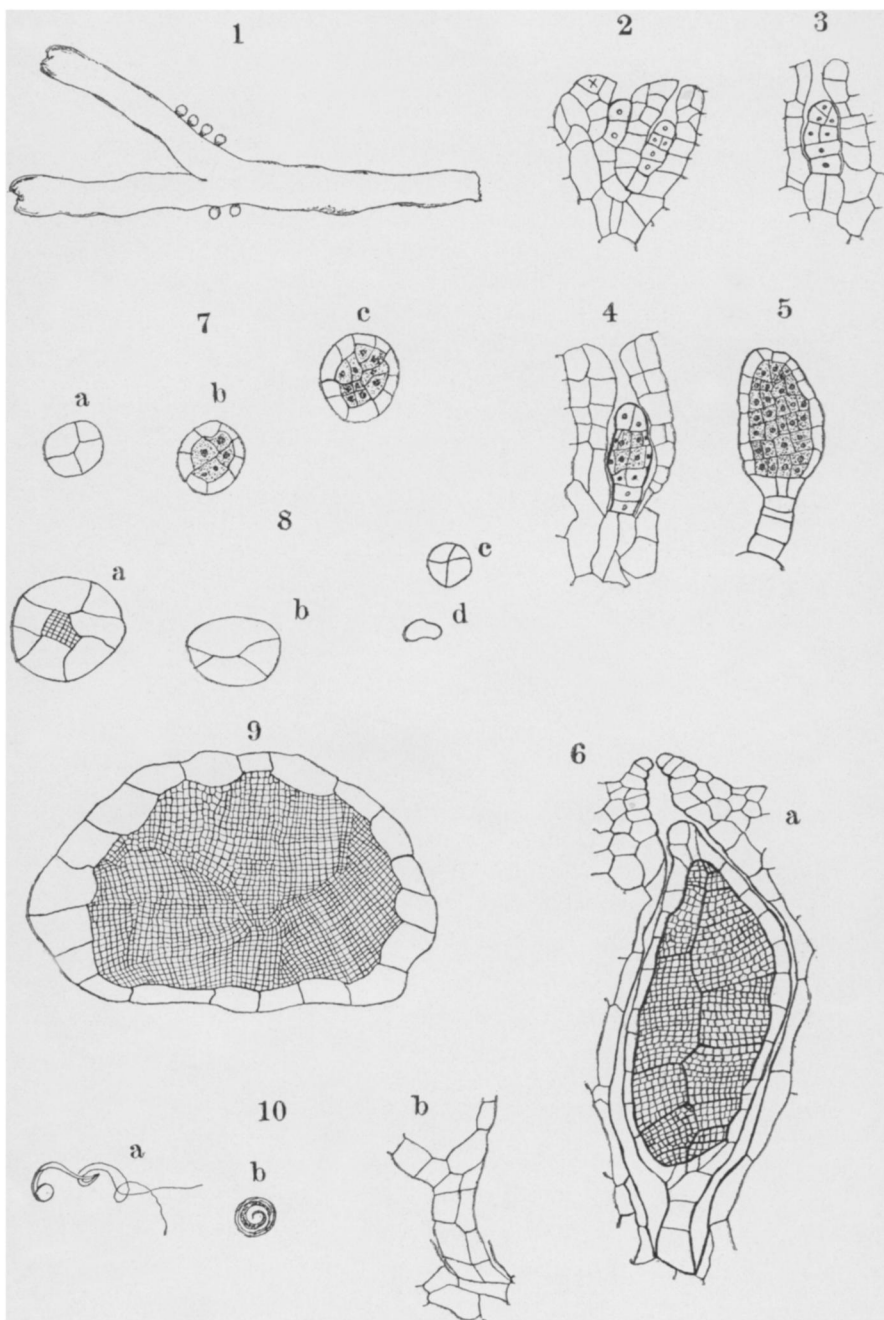
Targionia is our sole representative of the family Targionieae, which includes the genus *Cyathodium*. *Targionia* is perennial, becoming completely dried up at the end of the rainy season, and remaining so until the rains set in again, when it begins at once to grow actively. The structure of the thallus is similar to that of the typical Marchantiaceae, except that the branching is not usually dichotomous, but instead is largely due to lateral adventitious branches growing from the ventral surface. The antheridial shoots are of this character and may be easily recognized by their flattened oval form, small size and wavy outline.

The antheridia arise in acropetal succession from single superficial cells of the dorsal segment of the apical cell, so that in a vertical longitudinal section of a young plant, nearly all stages of development may be seen. The first division of the primary cell is a transverse one, separating the antheridium proper from the stalk-cell. (Fig. 2.) This is followed by at least two similar walls, but the number varies considerably, four being the greatest number

*1: 45. 1838.

† This study was suggested by Dr. Douglas Houghton Campbell, of Leland Stanford Junior University, and was prepared under his direction.

‡ Underwood's Hepaticae in Gray's Manual, sixth edition, 1889.



DEVELOPMENT OF THE ANTHERIDIUM IN *TARGIONIA* HYPOPHYLLA.

found. The second series of divisions are vertical and are formed only in the middle segments and divide each into the quadrants of a circle as seen in cross section. (Fig. 7, b.) The separation of the sperm-cells is brought about by a series of periclinal walls by means of which four central cells in each segment are separated from as many peripheral ones. (Fig. 7, b, c.) The upper and lower segments do not seem to take any part in the formation of sperm-cells, the upper usually being prolonged into a beak, while the lower one forms the base of the antheridium.

The lower of the two divisions of the antheridial mother-cell divides usually by three transverse walls to form a stalk. This stalk may be a single row of cells, or a vertical division may take place, making a double row. (Fig. 6, b.)

The contents of the central cells become much denser than those of the outer ones. The former begin to divide actively, the walls being formed at right angles, thus making a large number of nearly cubical sperm-cells.

From the time the antheridium first becomes recognizable, there is a rapid growth of the cells immediately surrounding it. These grow up about the antheridium, which thus becomes sunk in a deep cavity whose walls are extended into a tubular neck, projecting above the general level of the thallus, and through which the spermatozoids escape.

The wall-cells of the antheridium are very large and distinct, and fill the whole cavity between the body of the antheridium and the wall of the cavity. (Fig. 6, a.)

The complete development of the spermatozoids was not followed, but there was nothing to indicate any variation from what has already been described in other liverworts. The nucleus shows the usual flattened form, after the last division of the central cells, and the sperm-cells remain in pairs. The full grown spermatozoid shows one and one-half complete coils; the two cilia are longer than the body, and the vesicle is plainly evident.

Explanation of Plate 268.

Fig. 1. Male plant with antheridial branches; \times 3.

Fig. 2. Vertical longitudinal section; apical cell; two very young antheridia \times 400.

Figs. 3, 4, 5. Successive stages in the development of the antheridium; $\times 400$.

Fig. 6, a. Full grown antheridium; $\times 300$; b. stalk showing three rows of cells; $\times 400$.

Fig. 7. Three cross sections from the upper part of an antheridium; a. toward the apex; b. c. lower down; $\times 400$.

Fig. 8. Cross sections from the lower part of an antheridium, d. being the lowest segment; $\times 400$.

Fig. 9. Cross section of a full grown antheridium near the center; $\times 400$.

Fig. 10. a. Full grown spermatozoid; b. sperm-cell with nearly developed spermatozoid.

Notes on *Potentilla*.—I.

BY P. A. RYDBERG.

The author has been studying the genus *Potentilla* for some time. The plan is to prepare a revision of the North American *Potentilleae* and have it published as Volume 2 of the *Memoirs* from the Department of Botany of Columbia College. It is planned to contain, if possible, full size illustrations of all native species of *Potentilla*, *Horkelia*, *Ivesia*, etc. The best way the author knows of, to secure the coöperation of other botanists is to publish some of the results already obtained. He will regard it as a great favor to be permitted to look over and name any collection of North American species, and will be very thankful for any information, suggestion or criticism that may be given.

It will be seen from the following that my opinion as to the limitation of the species differs widely from those expressed in our manuals and from Dr. Watson's revision of *Potentilla* in the *Proceedings of the American Academy of Arts and Sciences*, 8: 549–573. They agree, however, very closely with those held by the late Dr. Christian Lehmann, of Hamburg. This eminent botanist after having studied the genus about forty years, having published several papers on it from time to time, among others a monograph in 1820, and having prepared the text for the genus *Potentilla* in Hooker's *Flora Boreali-Americana*, issued in 1856 his "*Revisio Potentillarum*," a quarto of 250 pages and 64 plates. This book, which always will remain as one of our standard works, will serve as the basis of my revision.